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Patent Claims

5 1. An apparatus for determination of the spatial alignment of a semitrailer (6) or trailer which is connected to a prime mover (5), having sensor means (7, 8) which are arranged on the prime mover (5) in order to produce sensor signals which describe the spatial
10 alignment of the semitrailer (6) or trailer relative to the prime mover (5), with the sensor means (7, 8) detecting contours of the semitrailer (6) or trailer, characterized

15 in that the sensor signals which are produced by the sensor means (7, 8) include image information from a two-dimensional representation (16) and/or a linear scan (16') of the detected contours of the semitrailer (6) or trailer, and with an evaluation unit (15) using the image information to determine at least one angle
20 variable which describes an angle between the prime mover (5) and the semitrailer (6) or trailer.

2. The apparatus as claimed in claim 1, characterized
25 in that, in order to determine the at least one angle variable, the evaluation unit (15) evaluates geometric characteristics and/or the rate of change of geometric characteristics of the two-dimensional representation (16) and/or of the linear scan (16') of the contours of
30 the semitrailer (6) or trailer.

3. The apparatus as claimed in claim 1 or 2, characterized
35 in that the evaluation unit (15) determines a first angle variable, which describes an angle (α) between an axis which is oriented in the longitudinal direction of the prime mover (5) and an axis which is oriented in the longitudinal direction of the semitrailer (6) or

trailer, and/or determines a second angle variable, which describes an angle (β) between an axis which is oriented in the vertical direction of the prime mover (5) and an axis which is oriented in the vertical 5 direction of the semitrailer (6) or trailer.

4. The apparatus as claimed in claim 3, characterized

in that the evaluation unit (15) determines a first 10 angle rate variable and/or a second angle rate variable, with the first angle rate variable representing the rate of change or derivative of the first angle variable, and the second angle rate variable representing the rate of change or derivative 15 of the second angle variable.

5. The apparatus as claimed in claim 3 or 4, characterized

in that the evaluation unit (15) uses the first angle 20 variable and/or the second angle variable, and/or the first angle rate variable and/or the second angle rate variable, to determine a mass variable which describes the current mass of the semitrailer (6) or trailer.

25 6. The apparatus as claimed in claim 3 or 4, characterized

in that the evaluation unit (15) uses the first angle 30 variable and/or the second angle variable, and/or the first angle rate variable and/or the second angle rate variable, to determine a mass distribution variable, which describes the distribution of the mass along an axis which is oriented in the longitudinal direction of the semitrailer (6) or trailer.

35 7. The apparatus as claimed in claim 3 or 4, characterized

in that the evaluation unit (15) uses the first angle variable and/or the second angle variable, and/or the

first angle rate variable and/or the second angle rate variable, to determine a center of gravity height variable, which describes the height of the center of gravity of the semitrailer (6) or trailer.

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8. The apparatus as claimed in claims 5 and 6, characterized

in that the evaluation unit (15) determines a threshold value for the first angle variable and/or for the first 10 angle rate variable as a function of the mass variable and of the mass distribution variable, with the evaluation unit (15) appropriately influencing drive means (26) and/or braking means (28) and/or steering means (30) for the prime mover (5) and/or braking means 15 (36) in the semitrailer (6) or trailer in order to prevent the magnitude of the first angle variable and/or of the first angle rate variable exceeding the respectively determined threshold value.

20 9. The apparatus as claimed in claim 8, characterized

in that the evaluation unit (15) produces a driver warning if the difference between the magnitude of the first angle variable and/or between the magnitude of 25 the first angle rate variable and the respectively determined threshold value is less than a respectively predetermined limit value.

10. The apparatus as claimed in claim 8 or 9, 30 characterized

in that the evaluation unit (15) determines the threshold value for the first angle variable and/or for the first angle rate variable taking into account the instantaneous driving state of the prime mover (5).

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11. The apparatus as claimed in claims 5 and 7, characterized

in that the evaluation unit (15) determines a threshold

value for the second angle variable and/or for the second angle rate variable as a function of the mass variable and of the center of gravity height variable, with the evaluation unit (15) appropriately influencing 5 drive means (26) and/or braking means (28) and/or steering means (30) for the prime mover (5), and/or braking means (36) in the semitrailer (6) or trailer, in order to prevent the magnitude of the second angle variable and/or the magnitude of the second angle rate 10 variable exceeding the respectively determined threshold value.

12. The apparatus as claimed in claim 11, characterized 15 in that the evaluation unit (15) produces a driver warning if the difference between the magnitude of the second angle variable and/or between the magnitude of the second angle rate variable and the respectively determined threshold value is less than a respectively 20 predetermined limit value.

13. The apparatus as claimed in claim 11 or 12, characterized 25 in that the evaluation unit (15) determines the threshold value for the second angle variable and/or for the second angle rate variable taking into account the instantaneous driving state of the prime mover (5).

14. The apparatus as claimed in claims 5 and 6, 30 characterized in that the evaluation unit (15) determines a nominal value for the first angle variable and/or for the first angle rate variable as a function of the mass variable and of the mass distribution variable, with the 35 evaluation unit (15) appropriately influencing drive means (26) and/or braking means (28) and/or steering means (30) for the prime mover (5) and/or braking means (36) in the semitrailer (6) or trailer in order to

allow the first angle variable and/or the first angle rate variable to assume the respectively determined nominal value.

5 15. The apparatus as claimed in claim 14,
characterized

in that the evaluation unit (15) determines the nominal value for the first angle variable and/or for the first angle rate variable taking into account the
10 instantaneous driving state of the prime mover (5).

16. The apparatus as claimed in claim 14 or 15,
characterized

in that means (55, 56) are provided for detection of the roadway profile, with the evaluation unit (15) taking into account the detected roadway profile in the determination of the nominal value of the first angle variable and/or of the nominal value of the first angle rate variable.

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17. The apparatus as claimed in claims 5 and 7,
characterized

in that the evaluation unit (15) determines a nominal value for the second angle variable and/or for the second angle rate variable as a function of the mass variable and of the center of gravity height variable, with the evaluation unit (15) appropriately influencing drive means (26) and/or braking means (28) and/or steering means (30) for the prime mover (5), and/or
25 braking means (36) in the semitrailer (6) or trailer, in order to ensure that the second angle variable and/or the second angle rate variable assumes the respectively determined nominal value.

30 35 18. The apparatus as claimed in claim 17,
characterized

in that the evaluation unit (15) determines the nominal value for the second angle variable and/or for the

second angle rate variable taking into account the instantaneous driving state of the prime mover (5).

19. The apparatus as claimed in claims 17 or 18,
5 characterized

in that means (55, 56) are provided for detection of the roadway profile, with the evaluation unit (15) taking into account the detected roadway profile in the determination of the nominal value of the second angle 10 variable and/or of the nominal value of the second angle rate variable.

20. The apparatus as claimed in claim 3 or 4,
characterized

15 in that means (55, 56) are provided for detection of the spatial alignment and/or of the dynamic response of the prime mover (5) relative to the contours of the roadway, with the evaluation unit (15) using the detected spatial alignment and/or the detected dynamic 20 response of the prime mover (5) relative to the contours of the roadway to determine the spatial alignment and/or the dynamic response of the vehicle combination and/or of the semitrailer (6) or trailer relative to the contours of the roadway by taking into 25 account the first angle variable and/or the second angle variable, and/or the first angle rate variable and/or the second angle rate variable.

21. The apparatus as claimed in claim 1,
30 characterized

in that the sensor means (7, 8) comprise an arrangement of imaging sensors, which are designed to detect electromagnetic waves in the visible or invisible optical wavelength range or in the radar wavelength 35 range.

22. The apparatus as claimed in claim 1,
characterized

in that the sensor means (7, 8) are part of a blind angle monitoring device for the prime mover (5).

23. The apparatus as claimed in claim 3 or 4,
5 characterized

in that the first angle variable and/or the first angle rate variable, and/or the first angle rate variable and/or the second angle rate variable are used to provide a parking aid and/or a reversing aid.

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24. Use of a blind angle monitoring device or rearward area monitoring device in order to determine an angle variable which describes an angle between a prime mover (5) and a semitrailer (6) or trailer, as claimed in one
15 of the preceding claims.

25. A method for determination of the spatial alignment of semitrailer (6) or trailer which is connected to a prime mover (5), in which sensor signals
20 are produced which describe the spatial alignment of the semitrailer (6) or trailer relative to the prime mover (5) with contours of the semitrailer (6) or trailer being detected in order to produce sensor signals,

25 characterized

in that the sensor signals which are produced by the sensor means (7, 8) include image information from a two-dimensional representation (16) and/or a linear scan (16') of the detected contours of the semitrailer (6) or trailer, with the image information being used
30 to determine at least one angle variable which describes an angle between the prime mover (5) and the semitrailer (6) or trailer.